rWeather Newsletter

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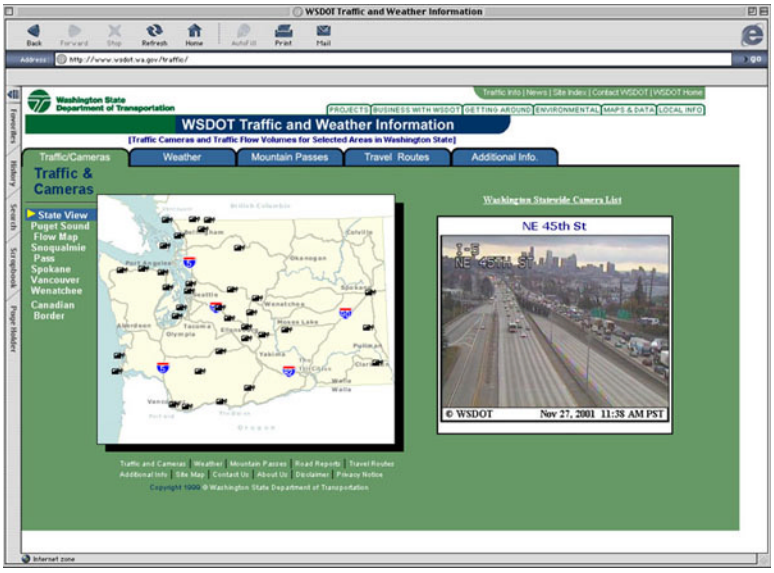
Redesigned rWeather Site Offers More Information, Easier Use

The Washington State Department of Transportation unveiled a redesigned, reorganized rWeather Web site November 5th to showcase WSDOT's new vision for statewide traveler information. Renamed the WSDOT Traffic and Weather Information site, it continues to provide the same unique combination of weather and travel information available on the rWeather site, only in a new, improved format. The organization of the information has been simplified, navigation through the site has been made easier, and the site has a cleaner look and simpler, more open feel for visitors.

The updated site, found at www. wsdot.wa.gov/traffic, offers information within a new combination of five primary categories: traffic and cameras, weather, mountain passes, travel routes, and additional information.



Traffic/Cameras

This section features a clickable state map that offers camera views of freeway traffic, as well as links to local traffic maps such as Seattle's FLOW map. The inclusion of new, pop-up zoom boxes eases the visitor's task of zooming in to smaller regions and closer views. Several new city- and area-specific views also enhance the level of detail.

Weather

This section offers maps of current and forecast weather conditions. It also offers radar and satellite reports, as well as specialized weather reports for ferry trips. An improvement is that National Weather Service forecast warnings (for snow, high winds, ice) have been integrated into the forecast information and are indicated visually and textually. The weather maps also include the more functional zoom feature and definitive forecast

boundary outlines. Whereas the previous site showed flags that users would click to view temperatures, the new version shows temperatures directly on the map, and these can also be selected as links to more information. Also included is a text list of weather station information that changes in relation to the viewer's zoom level. One final feature is a search option that allows users to locate weather information stations via each station's name.

Mountain Passes

This section, which contains mountain pass reports, maps, and camera views, also offers new information on road restrictions, including a comprehensive, integrated list of restrictions. Quick links to pass-related travel routes are also provided for a comprehensive look at mountain conditions.

Travel Routes

This section shows a clickable map and detailed list of reports on construction projects, maintenance operations, incidents, and special events. It also provides access to a map and list of measured air temperatures from 28 statewide weather stations and predictive pavement surface temperatures for the entire state highway network from the University of Washington's MM5 forecast model. Additions expected shortly are highway advisory reports and local variable speed limits along the I-90 Snoqualmie Pass corridor.

Another portion of this section has proved to be popular with the public: weather conditions presented along an entire travel route or corridor. More travel corridors are now available, and more will continue to be added. The developers hope to eventually include all mountain passes.

The Motivation for Change

The changes in the site's organization are based on tests conducted during summer 2001 at the University of Washington's Laboratory for Usability Testing and Evaluation. Usability tests on the previous version of the Web site indicated that users could not always easily find the information they needed. Several iterations of improvements and testing resulted in the updated site.

To add features and functionality without hindering the download times of viewers at home or work, the updated site was developed with several advanced software packages, including Java and Cold Fusion. This gives the application more flexibility and a greater ability to quickly deliver a multitude of advanced features. For example, the graphics are greatly improved, but visitors will notice little, if any, an increase in load time. Java also makes data processing more efficient and reduces the run-time of server-related processes, increasing the timeliness of the information. For example, information that was 30 to 45 minutes old on the previous site might now be no more than 10 to 20 minutes old.

A more modular design will also allow WSDOT to easily add a variety of information layers as they become available.

The updated site was designed for the latest series of browsers, Netscape 6.x and Internet Explorer 5.x, and takes advantage of their latest features. Older browsers will be automatically directed to and supported by the previous Web site until work-arounds can be devised to make the new site compatible with them. During this transitional period, Macintosh users will also encounter some dysfunction that PC users will not experience.

For more information about the site or its development, contact Bill Brown, WSDOT Olympic Service Center Traffic, 206-616-9183

Survey of WSDOT Maintenance Personnel Reveals Mixed Views Of Road/Weather Information Sources

Particularly in winter, weather information is crucial for making both proactive and reactive road maintenance decisions,. A recent survey of Washington State Department of Transportation (WSDOT) maintenance personnel looked at the winter weather information that they need to conduct their jobs, where they get that information, and how road-weather information systems, including the state's rWeather Web site, are regarded and used. The survey revealed that while newer, less traditional information sources offer many benefits for road maintenance, they are accompanied by challenges in motivating personnel to trust and use them.

A survey of 129 WSDOT road maintenance staff was conducted in May 2001. Survey respondents reported that their most common winter maintenance problems are black ice, frost, and snow accumulation. To address these road hazards, they reported using road patrols extensively. Other common practices are plowing and sanding, anti-icing (to prevent an ice/road bond), and de-icing (to break an ice-road bond).

Weather Information Use

WSDOT maintenance personnel choose from a variety of weather information sources. The most frequently consulted information resources are patrol reports, reviewed by the vast majority of respondents, local broadcast TV, local broadcast radio, and the Internet. Less often used are the rWeather Web site, Northwest WeatherNet, cable TV, ScanWeb (reporting WSDOT road/weather information station data), and the National Oceanic and Atmospheric Administration radio.

Overwhelmingly, respondents reported that road condition information (wet, icy) is most useful to them in making winter maintenance decisions. Also very useful are air temperature, precipitation, and pavement temperature. Less important are chemical

presence, dew point, visibility, subsurface temperature, and wind speed and direction. Camera images were deemed least important of all.

Of the respondents who indicated that they have a road/weather information station (RWIS) in their maintenance area, the majority reported that they are only somewhat satisfied with the accuracy of the data, the location of stations, the reliability of the equipment, and the availability of training. Many also reported that they do not use ScanWeb, the Web resource based on WSDOT RWIS data. However, the vast majority

Point Of View: Winter Maintenance Survey

Bob Stowe, Assistant Regional Administrator for Maintenance in the Washington State Department of Transportation's North Central Region, has pioneered innovation in winter maintenance operations within WSDOT based on the use of new sources of weather information. He was asked for his perspective on the results of the winter maintenance survey.

Q.
What has caused some WSDOT regions and areas to embrace new sources of weather information and others to use them much less?

Stowe:
The use of new weather information sources is driven by the nature of winter maintenance operations. Plowing and sanding are reactive. You can't do it until after it snows. When we relied heavily on plowing and sanding, our people didn't have any need for any better weather information than what they could get from radio or TV or calling the National Weather Service.

But as we switched from plowing and sanding to an operation that depends on proactive anti-icing with liquid chemicals, our need for weather information changed. Now we have to plan the application of chemicals, and to plan, we have to know what the weather will be like in the next several days. We need to know when to apply anti-icers and how much to apply—if it rains, it's wasted money. So changing to proactive weather operations is what has driven our interest in weather information. We know that the maintenance decisions we make will be better if we know what weather is coming up.

Q.
What kinds of information do your maintenance personnel need?

Stowe:
Our maintenance people want to have a good forecast for frost or snow. They want to know roadway surface temperature, and they want to know far enough in advance to be able to plan the timing of an anti-icing application and know how much to use. The application rates may change, depending on whether we experience a good snowstorm or just frost.

Q.
Have you been satisfied with the reliability of the information?

Stowe:
If the information is wrong (say, a forecast storm doesn't happen), it can cost us money. The information is not infallible; no weather forecast is. But the big picture is that we have a much better operation, a better level of service at a reasonable cost.

Q.
How is the North Central Region using new information sources, and what benefits have you seen?

Stowe:
There have been so many changes in the North Central Region that have been affected by [new weather information] that it's hard to put it all in perspective. The changes have not occurred overnight, but over a long period of time.

With the RWIS our maintenance staff can monitor current conditions without people having to go out into the field. With RWIS they can look at pinpoint locations and draw conclusions about the rest of the roadways they're responsible for. Although many regions rely heavily on road patrols, we don't use many road patrols except in the mountains. This helps with crew time and equipment. Since we're not doing road patrols all the time, many maintenance sheds don't operate at night because the night shift is not needed, and we don't need as many temporary, part-time employees for the winter as we used to. We are able to use our permanent, full-time employees more effectively. It all comes together.

also reported that having additional stations in their maintenance area would be useful in making snow and ice control decisions.

Nearly 80 percent of respondents were aware of the rWeather Web site, and of those, close to 80 percent had used it. They cited National Weather Service warnings, satellite and radar images, and the statewide weather map as the most valuable features of rWeather. Interestingly, less than half of the respondents reported that rWeather pavement temperatures are useful. The reason for this may be that the pavement temperatures provided by rWeather are modeled rather than reported from direct measurements and are presented as ranges rather than precisely.

Just over 65 percent of respondents indicated that they were very or generally satisfied with the weather information they had available to support winter maintenance decisions during the winter of 2000/2001. An additional 20 percent indicated that they were only somewhat satisfied.

Benefits to Road Maintenance

Better weather information has the potential to benefit road maintenance operations in numerous ways. Resources such as RWIS can provide more weather data, better inform travelers, reduce patrolling, increase the efficiency and cost-effectiveness of anti-icing, increase the efficiency of resource allocation during an event, increase the efficiency of paving operations scheduling, and increase the cost-effectiveness of call-outs and overtime. These benefits have the potential to improve weather forecasts; better prepare drivers; reduce equipment, material, and labor costs; improve labor productivity; and increase level of service.

The survey respondents were asked specifically whether they had experienced savings as a result of using detailed weather information. A significant number of respondents cited more efficient use of labor, labor hour reductions, equipment hour reductions, and lower material costs.

Challenges to Widespread Use

While some maintenance personnel are eager to use new sources of weather information, others are more reluctant or even unable to do so. Respondents clearly stated that traditional sources of information will never be obsolete, and that individuals' experiences will always be important to road maintenance decisions. Some of the challenges that stand in the way of widespread use of new information sources include a lack of training, a lack of access, and a distrust of data accuracy and reliability.

Supervisory staff are more likely to rely on non-traditional sources of information than lower-level maintenance personnel. For example, about twice as many supervisors as other staff use ScanWeb and rWeather. This probably relates to the amount of training

that maintenance personnel have received. Even though other maintenance staff often make front-line maintenance decisions, many more of them than their supervisors have not received training in interpreting weather information. In addition, whereas all supervisors reported having Internet access at work, many of their staff do not have access to computers or the Internet at their work sites.

Changes Under Way

The most requested improvements to weather information, and thus the information features of most concern to users, were better reliability and more detail. Respondents would also like more tailored and more frequent information. To entice maintenance personnel to non-traditional information sources, useful information must not only be available, but it must be consistently accurate and reliable.

Respondents were also asked to indicate which RWIS-related activities should receive further investment. Two of the three most desirable activities related to training: both in the interpretation of weather data and in anti-icing strategies.

In fact, as a result of the survey, some changes are already under way at WSDOT. A statewide training effort has been undertaken to increase personnel understanding of weather forecasting data and tools and how to interpret and use them. WSDOT is also in the process of ensuring that remote maintenance sites have Internet access.

For more information about the survey, contact Catherine Bradshaw Boon, Washington State Transportation Center Research Engineer, cmbrad@u.washington.edu, 206-685-9202.

2002 Olympic Games: Public/Private Sectors CooperateTo Predict The Weather Better

Next February and March, the largest and most complex consortium of public agencies and private organizations yet assembled to collect and provide weather data will forecast weather specific to travel corridors and sports venues to aid the transportation, performance, and safety, of athletes, Games officials, and spectators during the 2002 Winter Olympic Games.

The organization of the weather support system for the Games is unique in the wide array of public agencies and private businesses working together. Although some of the forecasters and data collection were organized and installed expressly to support the Olympic Games, this weather information enterprise also demonstrates how systems and infrastructure in place for various purposes, such as the Utah Department of Transportation's road/weather information stations, can be successfully coordinated to provide weather and travel information for wider public use.

Utah Weather

The Olympic weather support system must meet the diverse requirements of the 2002 Winter Games in the context of Utah's winter weather. Severe Utah weather can include lake-effect snowstorms, ice fog, localized winds, and downslope windstorms. It can produce poor visibility, extreme wind chills, tractionless road surfaces, and avalanches.

Any of this weather could impede travel throughout the area by athletes and spectators. The indoor venues are located within the 68-mile Salt Lake City metropolitan corridor west of the Wasatch Mountains along Interstate 15, and the five outdoor venues lie in the eastern flank of the Wasatch Mountains. A large number of spectators will travel from accommodations located up to 100 km away from the venues.

Utah weather also has the potential to threaten the health and safety of outdoor spectators, delay or postpone Olympic events, decrease air quality and create respiratory problems, interrupt flights over the mountain passes, hinder snow making and the performance of outdoor ceremonies, and very importantly, interfere with crucial security and emergency operations.

Transportation and Weather

Northwest WeatherNet (based in Issaquah,Wash., and providing weather services for 14 western states) provides the Utah Department of Transportation (UDOT) with road weather and pavement condition forecasts. According to Steve Conger, winter operations and avalanche specialist and state RWIS supervisor for UDOT, road maintenance and

snow removal will be conducted as usual, although some key maintenance offices will operate earlier or longer hours than normal. Also, a meteorology intern is normally found in UDOT's Traffic Operations Center during commute times and severe weather. During the Games, this intern will be replaced in the control room by a Northwest WeatherNet meteorologist for 12-hour shifts to enhance communication.

Weather Forecasting

The NOAA Cooperative Institute for Regional Prediction will oversee data collection and monitoring. The National Weather Service will provide forecasts for public service, and KSL TV (the Salt Lake National Broadcasting Company (NBC) television affiliate) will provide forecasts for use by the Salt Lake Olympic Committee to serve the Games.

NOAA Cooperative Institute for Regional Prediction

The Cooperative Institute for Regional Prediction (CIRP) at the University of Utah received $1.3 million from the federal government over five years to develop a weather tracking system specifically for the Utah Games.

Since 1996, weather data collection equipment has been installed cooperatively by the Salt Lake Olympic Committee, CIRP, National Weather Service, Utah Department of Transportation, and the commercial firms and state agencies managing the outdoor Olympic venues. A unique partnership called MesoWest has evolved since that time within the government, commercial, and research communities to share weather information in northern Utah and throughout the western U.S.

As a result of these preparations, during the Games weather observations will be collected from over 279 locations in the northern Utah region. The weather stations are owned and operated by 15 commercial firms, eight local and state agencies, and nine federal agencies. Their primary purposes for collecting weather data include winter road maintenance, water resource management, air quality monitoring, equipment development, agriculture, ski area operation, and emergency management. Data will be collected at 5- to 60-minute intervals and relayed to the University of Utah via ethernet, phone, cellular phone, radio, satellite, and meteor burst technologies. CIRP will also collect and disseminate temperature, wind, humidity, and precipitation observations from 27 automated weather stations at the five outdoor Olympic venues, and weather stations will also be located near all of the indoor venues.

Weather observations will be integrated into surface analyses of temperature, wind, and moisture over the western United States and northern Utah every 15 minutes. CIRP will provide these weather observations and analyses to National Weather Service forecast offices every 15 minutes and to the National Center for Environmental Prediction for use in weather prediction models.

To conduct numerical weather forecasts, CIRP will run a high-resolution computer model twice daily and provide output from the model to the National Weather Service Operations Center and Olympic venue forecasters. The model will also generate hourly forecasts of temperature, wind, relative humidity, and precipitation for weather sensitive locations along transportation corridors and at outdoor Olympic venues.

National Weather Service (NWS)

The NWS role in support of the Games will be to provide area-wide and road corridor forecasts and warnings to protect lives and support travel, aviation operations, security, and emergency management. Beyond routine NWS operations, supplementary NWS forecasters will coordinate warnings and forecasts with the KLS TV forecasters.

NWS forecasters will also issue Hazardous Winter Weather Potential statements twice daily. These forecasts of weather, wind, temperature, and snowfall amount will focus on the primary transportation corridors through the Wasatch mountains. The Utah Department of Transportation will use these forecasts and those by Northwest WeatherNet to inform its road maintenance and avalanche control operations.

The NWS will distribute weather guidance to users through a public Web page and other routine distribution methods. NWS products will also be inserted into the protected communications system operated by the Utah Olympic Public Safety Command, a consortium of local, state, and federal security and safety agencies.

KSL TV

The KSL TV team, led by the Salt Lake Olympic Committee's (SLOC) Chief Meteorologist Mark Eubank, will prepare detailed, micro-scale weather forecasts for the five outdoor venues. They will continually brief athletes, coaches, team captains, venue managers, Olympic officials, and accredited media, as well as the SLOC main operations center. The KSL TV venue team comprises retired NWS meteorologists and personnel from private forecasting companies. At least one meteorologist will be at each venue. Each will have on-site access to the latest weather observations, graphics, and model data.

Venue forecasters will be assisted by weather volunteers. The volunteers will provide supplemental, manual observations starting one hour before each outdoor event begins and continuing at 15-minute intervals throughout the event.

Other Participants

A communications system has been installed at the Aviation Security Operations Center (ASOC) at Hill Air Force Base to improve coordination between the SLOC and ASOC forecasters who will brief pilots flying to venues. The U.S. Air Force will also deploy portable weather stations near several outdoor venues.

The U.S. Forest Service Utah Avalanche Center will be located at the SLOC Weather Operations Center. Avalanche forecasters will provide guidance to security personnel on risks near the backcountry perimeters of avalanche-prone venues.

The Defense Threat Reduction Agency will coordinate the efforts of a number of government agencies and will provide specialized forecasts to mitigate hazardous spills or releases. Ambient air quality is monitored by the Utah Air Monitoring Center to protect the health of Utah citizens and Olympic visitors.

Legacy of the Games

John Horel and other authors of a paper submitted to the Bulletin of the American Meteorological Society predict that the weather support infrastructure developed for the Winter Olympics will provide long-term benefits to the public. They write that better tools will be in place to monitor and predict storms during all seasons. The experience gained from using these tools during the Games should help in further improving both operations and research models.

On-Line Information

Olympic Weather Support Project: http://www.met.utah.edu/olympics

Current weather conditions: http://www.met.utah.edu/mesowest

Numerical weather forecasts: http://www.met.utah.edu/jimsteen/mm5/

Official public Internet site for the 2002 Winter Games http://www.saltlake2002.com

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To discuss any of the information in this newsletter contact Bill Brown by email: <wwbrown@u.washington.edu> or by phone: (206)616-9183.

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